Two Studies Unveil Seizure Prediction Models in Critically Ill Children

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SEATTLE, December 7, 2014 – Current methods of seizure detection are limited to EEG brain monitoring, a resource intensive and costly practice that can only be performed by specialists. Making EEG monitoring more effective may require strategies to identify critically ill children at highest risk for seizures so EEG monitoring can be performed for those children. In a pair of studies to be featured at the American Epilepsy Society’s (AES) 68th Annual Meeting, researchers describe innovative models for predicting seizure occurrence in critically ill children.

One study (Platform A.2) examines potential risk factors for early post-traumatic seizures (EPTS) in 135 children with acute traumatic brain injury. Researchers used the findings to create a model for predicting seizures, including subclinical seizures and status epilepticus (SE), in critically ill children. Patients admitted to the pediatric intensive care unit (PICU) at the University of California Los Angeles (UCLA) Medical Center from October 2008 to April 2014, and to the PICU of Children’s Hospital of Colorado from July 2008 to May 2010, were placed on continuous EEG monitoring to evaluate possible EPTS risk factors, such as age, gender, Glasgow Coma Scale (GCS) score, CT scan findings and causes of injury.

Researchers report that 39 of the 135 patients had seizures during the monitoring period, with 17 experiencing subclinical seizures and 15 experiencing subclinical SE. Abusive head trauma (AHT) was the leading cause of subclinical seizures (53.8%). Patients who experienced subclinical seizures unanimously showed intradural hemorrhage on a CT scan.

Dr. Rajsekar Rajaraman, a Pediatric Neurology resident with UCLA Medical Center’s Division of Child Neurology, reports that “one of the possible severe consequences of traumatic brain injuries are seizures. By identifying predictors for subclinical seizures, we can treat them sooner and be more strategic with our continuous EEG monitoring.”

Continuous EEG monitoring is currently the only method for detecting subclinical seizures, which occurred in 12.6% of the cohort. The leading risk factors for subclinical seizures, according to the study, were young age and intradural bleeding. Children younger than 2 years who experienced intradural hemorrhage and/or AHT had the greatest risk for subclinical seizures.

Authors of a second study (Poster 1.182) present a seizure prediction model for use among critically ill children with multiple types of acute brain injury including traumatic brain injury, stroke, and brain infections. Identifying critically ill children at high risk for EEG seizures could allow limited EEG resources to be targeted at the highest risk children. The authors developed a predictive model using a retrospective multicenter database of critically ill children who had acute encephalopathy. They identified risk factors for seizure occurrence. They then evaluated the performance of the model in a second separate, single-center database. Predictor variables were chosen to be readily known to clinicians at admission and included age, etiology category, the presence of clinical seizures prior to cEEG, initial EEG background category and inter-ictal discharge category. Based on these predictor variables, clinicians could calculate a seizure prediction score. The model had fair-to-good predictive value. Establishing in-house cut-off points may prove useful, depending on the cEEG resources available.
to the center. Lower cut-off points would maximize the identification of patients predicted to experience electrographic seizures. Higher cut-off points, on the other hand, would exclude low-risk patients and therefore require fewer resources, but could potentially overlook some of the patients experiencing seizures.

Dr. Abend, an Assistant Professor of Neurology and Pediatrics at the Children’s Hospital of Philadelphia and the University of Pennsylvania, described that “EEG monitoring is rapidly increasing in critical care units yet there are limited resources available for interpreting EEG. Determining which critically ill children are at highest risk will allow us to best target EEG monitoring to those children. By improving the value of EEG monitoring, we can make it more feasible to implement in a widespread manner.”

Further, according to the authors, the findings suggest that a model developed from multicenter cEEG data can guide the use of EEG resources when applied at a single center. The fact that a model developed with multi-center data functioned reasonably at a single center suggests future multi-center studies may generate useful information despite some variability across centers based on patient characteristics and EEG monitoring practice.

Both research studies will be provided in full at the American Epilepsy Society Annual Meeting in Seattle, December 5-9. Abstracts referenced above can be found on the American Epilepsy Society’s Annual Meeting Page.

Editor’s Note: Authors of these studies will be available at a press briefing on December 7, 2014 at 12:30 PM (PT)/3:30 PM (ET), in the onsite press room, Room 304, Level 3 of the Washington State Convention Center. The call-in number for off-site journalists is 1-605-475-4000, passcode 521653#.

About the American Epilepsy Society
The American Epilepsy Society (AES) is a non-profit medical and scientific society. Our individual members are professionals engaged in both research and clinical care for people with epilepsy from private practice, academia and government. For more than 75 years, AES has been unlocking the potential of the clinical and research community by creating a dynamic global forum where professionals can share, learn and grow. AES champions the use of sound science and clinical care through the exchange of knowledge, by providing education and by furthering the advancement of the profession.

Information Contacts:
Ellen Cupo, Big Voice Communications, (203) 314-6545, ellen@bigvoicecomm.com
Natalie Judd, Big Voice Communications, (203) 605-9515, natalie@bigvoicecomm.com